

Required Courses:**8042101-2 Architectural Graphics (2: 4,2)****Prerequisite: 8021201-2 Engineering Drawing**

The course initially introduces the discipline of Architectural Engineering and the role of architectural Engineers in the process of building design, systems' integration, construction and operation. Graphical representation methods and techniques in architectural design and presentation are introduced. Drawing tools and materials; architectural drafting conventions; orthographic projections and views, their types and use in building presentation. Shades and shadows techniques. Freehand sketching and model-making techniques. Introduction to computer graphics using simple software tools.

8042102-3 Building Materials (3: 2,4)**Prerequisite: None**

Properties, behavior, and selection of building materials including wood, laminates, cements, aggregates, concrete, masonry mortar, steel, and finishing materials. Structural and architectural use of traditional and modern building materials. Introduction to basic methods of construction; excavation, foundations, building systems, and construction equipment and general techniques in wood, masonry, and concrete construction. New building materials. Visits to building sites and manufacturers.

8042201-2 Computer Applications in Building Design (2: 2,2) **Prerequisite: 8042101-2 Architectural Graphics**

Introduction to Computer-Aided Drafting and Design which includes: 2D drawings, 3D modeling, rendering, and Image processing. Major CAD drafting, and presentation software tools will be used for the production, management, and presentation of project information. Introduction to utilization of modeling and simulation software tools in Architectural Engineering.

8042202-2 History of Architecture (2: 2,0)**Prerequisite: None**

This course will introduce students to the evolution of history of architecture from prehistoric to the current period. It will also highlight significant events, styles, architects, buildings and other factors that would lead to an understanding of why various cultures produced the architecture of their time.

8043101-3 Architectural Design 1 (3: 3,6)**Prerequisite: 8042101-2 Architectural Graphics**

This course introduces the design process in the form of phases, activities, and parties involved. Topics covered include: Description of each phase, activities and objectives; models for problem-solving process in design utilizing graphic thinking. Problem definition, developments of alternatives, evaluation, selection of solution and communication of a design project are introduced, explored and exercised through both abstract sketches and definitive designs to solve simple design problems. Design problems of complete but simple buildings are introduced. Considerations of building function, construction materials and systems, cultural, environmental constraints, and climatic influences are emphasized. Individual design thinking is encouraged throughout the studio work.

8043102-3 Construction Systems (3: 4,0)

Prerequisite: 8042102-3 Building Materials

Construction systems including foundation, superstructure, enclosure (walls and roofs), interior finishes, partitions, and ceilings. Construction and detailing of site-built and prefabricated systems. Selection methods and criteria for appropriate design as a function of climate and energy use, labor and material availability, maintenance and replacement patterns, safety, functionality, and cultural context. Course material comprehension is ensured through submission of sketches, to-scale detail drawings and model-development of the introduced systems.

8043201-2 Introduction to Reports Writing (2: 3,0)

Prerequisite: 999807-2 English for Specific Purposes 1

Specifications of Engineering reports technical writing - Paragraphs, sentences and frame of reports technical writing - Expression modes in Engineering technical reports - Analysis of data - Method of writing of technical report - Studies, inspections, and tests.

8043202-3 Architectural Design 2 (3: 3,6)

Prerequisite: 8043101-3 Architectural Design 1

This course is a continuation of a two-semester sequence of design studios. Introduction and appreciation of the design process through more complex buildings and larger project sites. The concept of building design as a multi-disciplinary approach is introduced. Integration of structural, mechanical and environmental control systems with the building function, form and spaces organization is emphasized. Basic elements of architectural form and space and how they can be manipulated, organized in the development of design concept and their visual implications are explored.

8044101-3 Architectural Design 3 (3: 3,6)

Prerequisite: 8043202-3 Architectural Design 2

This course aims at assisting students to develop more skills through exercising an architectural multi story residential / public buildings situated in an urban complex. It explores the fundamentals of urban context and its relationship with the built environment. It introduces students to the perception of architectural spaces and develops their abilities to design large scale projects with complex spatial requirements involving concepts of design, ideas and imagination. Students are introduced to multiple concerns of vertical and horizontal circulation, orientation, spatial compositions and structure. Researching different structural systems, and the choice of building materials as an integral part of the design. Multiple circulation networks are also addressed. The course also focuses on designing buildings that include energy saving and environmentally friendly features. Emphasizing throughout the various design stages on the green aspects of the project that will lower costs and emissions while designing towards the most sustainable practice. The design studio employs energy harvesting and control of the natural elements as resources to enhance the sustainable cycle. Examples of selected projects would be University, office buildings, hospitals, multi-function towers, hotels,...etc.

8044102-3 Building Mechanical Systems (3: 2,4)

Prerequisite: 203205-4 Physics

Introduction to basic concepts, terminology and design methods for building mechanical systems. Thermal comfort, building thermal performance, and heating & cooling load calculation procedures. Fire protection systems and smoke control. Water supply and distribution systems; Waste and drainage systems. Vertical transportation systems. Computer applications.

8044103-2 Architectural Acoustics (2: 2,2)

Prerequisite: 203205-4 Physics

Introduction to architectural acoustics. Room acoustics and noise sources, measurements, and control. Acoustical properties of materials and room shapes. Sound absorption and transmission. Computer applications in room acoustics simulation.

8044201-3 Architectural Design 4 (3: 3,6)

Prerequisite: 8044101-3 Architectural Design 3

This course aims to develop the students' analytical capacities applied in the design of projects of complex nature, taking into account the local environment, nature and modern theories and smart systems in design. Projects will mainly be mixed use buildings gathered by one or more open spaces. Emphasizing throughout the various design stages on the philosophical aspects. Students acquire the skill to integrate inner and outer spaces through designing medium / large buildings in a landscape context. Moreover, they should be capable of designing landscape elements details through aesthetic forms and functions with the use of natural and man-made materials. The student should focus on applying all what is learnt in architectural design while illustrating his professional abilities through self- expression of the different interpretations of the modern theories. Focuses on innovative materials and structure selection and tackles the architectural aspects of environmental control with rational energy consumption. Based on the site intervention, the student will explore constraints and potentials, and will be able to integrate various aspects through urban/architecture design processes. Sustainability principles and future trends will be the framework for idea collaborations and concepts. By the end of the course the student will be well prepared to start his graduation phase. Examples of selected projects would be science parks, smart villages, airports, mega culture centers,...etc.

8044202-3 Building Illumination (3: 3,2)

Prerequisite: 203205-4 Physics

Concept of light, vision, and color. Luminaries and lamps. Lighting system design procedures; calculation and measurement techniques, evaluation of interior lighting quality, and daylighting. Computer applications in artificial and daylighting analysis and design.

8044203-3 Principles of Heating, Ventilating, and Air-conditioning (3: 4,0)

Prerequisite: 8044102-3 Building Mechanical Systems, 8022205-3 Fundamentals of Thermodynamics

Fundamental principles and engineering procedures for the design of heating, ventilating, and air conditioning systems; HVAC system characteristics; system and equipment selection; duct design and layout. Energy conservation techniques. Computer applications.

8044204-3 Working Drawings (3: 4,6)

Prerequisite: 8044101-3 Architectural Design 3, 8043102-3 Construction Systems

An introduction to the production of construction documents used in the building industry. A preliminary building design is developed to include detailed materials, and construction information. A set of drawings is completed including floor plans and elevations, site, foundation, framing and roof plans and details, wall and roof sections and details, interior finish elevations and details, and door and window schedules and details. Drawing skills are developed and office management issues are discussed.

8044301-2 Summer Training (2: 2,0)

Prerequisite: Department Approval

A continuous period of 8 weeks of summer working in the building industry to gain exposure and appreciation of the Architectural Engineering profession. On-the-job training can be acquired in one of the areas related to architectural engineering. The student is required to write a brief report about his work experience. The report should emphasize duties assigned to, and completed by the student.

8045101-3 Senior Design Project 1 (3: 3,6)

Prerequisite: 8044201-3 Architectural Design 4

Introduction to the approach and procedures of design of a system, component, or process to meet desired needs; types and impact of design constraints; requirements of the senior design project; topic selection, scope and limitations; collection of data, literature review; codes and standards identification; computing essentials, recognition of ethical responsibilities of the professional practice. A technical report and public oral presentation documenting the senior project proposal are fundamental requirements for completing the course. Teamwork is emphasized and greatly encouraged.

8045102-3 Building Economy (3: 3,0)

Prerequisite: None

Basic concepts of building economics: initial cost, life-cycle cost, cost and benefit ratio analysis, and control of cost and depreciation. Cost estimating, including determination of materials, labor, equipment, overhead, profit, and other construction costs.

8045101-3 Senior Design Project 2 (3: 3,6)

Prerequisite: 8045101-3 Senior Design Project 1

A comprehensive course that integrates various components of the curriculum in a comprehensive engineering design experience. The project should include development of system design and analysis techniques such as integrated design of structural, mechanical, electrical and environmental systems. The design should take place with consideration to appropriate constraints such as economic, safety, reliability, ethics, environmental, social, and cultural factors. Public oral presentations and written reports of the final design are essential requirements for completion of the course. Computer applications and teamwork, where appropriate, are greatly encouraged.

8045202-3 Construction Management (3: 3,0)

Prerequisite: None

A survey of Construction Management: Basic concepts, preparing the bid package, issues during construction phase, construction contracts, legal structure, time planning/control. Project cash flow; project funding, equipment ownership, equipment productivity, construction operations, construction labor, materials management and safety. Types of specifications, technical division, changes, bonds, liens, general conditions, special conditions and contract documents.

8045203-2 Professional Ethics (2: 2,0)

Prerequisite: None

This course is designed to provide students with information and a general understanding of the basic principles of professional ethics. General concepts on deontology, Ethics and profession. Concept of responsibility. Ethical reasoning; ethical Theories. ethical conflicts in the professional work of an Engineer.

Elective Courses:

8045301-2 Building Energy Analysis (2: 3,0)

Prerequisite: 8044102-3 Building Mechanical Systems

Application of thermal sciences to the evaluation of building energy systems; energy estimating methods; computer models for estimating building energy consumption; applications of various energy analysis computer programs; design methods for reducing energy consumption in buildings.

8045302-2 Computer-Aided Building Design (2: 3,0)

Prerequisite: 8042201-2 Computer Applications in Building Design

Introduction to Computer-Aided Building Design (CABD) software tools, their potentials, and limitations. Production of building systems design using computers. Use of computers in space planning, cost analysis, structural design, building services layout, mechanical systems, energy analysis, lighting analysis and design, and room acoustics evaluation. Choice of a software upon given conditions. Use and application of selected package(s) for various building applications.

8045303-2 Knowledge-Based Systems in Buildings (2: 3,0)

Prerequisite: 8042201-2 Computer Applications in Building Design

Computer-based decision-making problem solving, database and integrated approaches. Introduction to the theory of artificial intelligence and knowledge-based systems in Architectural Engineering. Conceptual design of CAD systems involving knowledge base approach. Overview of available Expert System shells, their potentials and limitations. Applications of selected packages in building design problems.

8045304-2 Structural Masonry (2: 3,0)

Prerequisite: 8014207-3 Reinforced Concrete

Masonry materials and their characteristics, non-load bearing wall construction, load bearing wall design, basics of design for vertical loading and lateral forces, stability and types of load bearing walls, structural elements and forms. Design of single-story structures reinforced and post tension masonry. Masonry architecture, vault and dome design. Complete design project, site visits and practical applications. Computer applications.

8045305-2 Planning and Design of Structural Systems (2: 3,0)

Prerequisite: 8014106-3 Structural Analysis

Fundamental concepts in the planning, design, and construction of complete structures. Design philosophies and criteria. The nature of loads and probabilistic determination of design loads. Selection of structural systems for buildings. Approximate analysis for preliminary design. Utilization of computers in structural engineering. Special problems in tall building.

8045306-2 Artificial Lighting Systems (2: 3,0)**Prerequisite: 8044202-3 Building Illumination**

Introduction to different lighting systems. Lighting requirements under different working conditions. Detailed understanding of artificial lighting sources. Quantity and quality of light for various architectural spaces. Polar curves for various artificial lighting sources. Design of artificial lighting systems for avoiding glare. Artificial lighting design of outdoor spaces.

8045307-2 Daylighting Analysis & Design (2: 3,0)**Prerequisite: 8044202-3 Building Illumination**

Introduction to daylighting. Sources of daylighting. Solar spectrum and its relationship to daylight availability. Weather phenomenon and daylighting. Concept of cloudiness and design sky: Performance of building materials with respect to daylighting such as reflectivity and absorption. Decomposition and decoloring of materials under daylight. Detailed study of daylight transmission through openings with shading devices. Solar geometry and design of sun-shading devices. Computer and lab methods for the study of daylight in buildings. Design of openings in desert areas with respect to glare and overheating.

8045308-2 Room Acoustics (2: 3,0)**Prerequisite: 8044103-2 Architectural Acoustics**

Acoustical phenomena in enclosed spaces. Sound-absorbing materials and constructions. Acoustical requirements for the design of enclosures for speech and music (e.g. studios, auditoria, and multipurpose halls). Techniques for evaluating room acoustics performance. Sound reinforcement systems; principal uses, basic elements, functional diagrams, and loudspeaker systems. Computer applications in sound behavior modeling and evaluation.

8045309-2 Noise Control in Buildings (2: 3,0)**Prerequisite: 8044103-2 Architectural Acoustics**

Noise sources and their effect. Transmission of noise in buildings; air-borne and structure-borne noise. Sound isolation and sound insulating construction. Mechanical systems noise and vibration. Noise control techniques. Computer applications.

8045310-2 Introduction to Building Maintenance Management (2: 3,0)**Prerequisite: 8045202-3 Construction Management**

Basic concepts of building maintenance management. Classification of maintenance types, work orders types, planning and scheduling of maintenance works, maintenance contract types. Organizing preventive maintenance activities. Maintenance contract documents.

8045311-2 Solar Energy in Buildings (2: 3,0)**Prerequisite: None**

Principles of solar energy collection, conversion, storage and distribution. Solar water heating, space heating and cooling applications, components and systems. Passive solar strategies. Computer applications.

8045312-2 Quantitative Methods in Construction Management (2: 3,0)

Prerequisite: None

An introduction to the application of modeling techniques to problems in construction management. Topics include the application of linear programming, transportation and assignment techniques, materials management, queuing and simulation.

8045313-2 Contracts and Specifications (2: 3,0)

Prerequisite: None

Contract documents, divisions of specifications, types of specifications, technical divisions options and alternatives, contracts, time and money, changes bonds liens, government contracts, general conditions, special conditions, proposal form, instruction to bidders, invitations to bid, checking, interpretation of specifications & computerized specifications. Saudi standard public works contract.

8045314-2 Special Topics in Fire safety Management (2: 3,0)

Prerequisite: None

The course introduces students to fire safety design; fire protection objectives; ignition, fire development and propagation in confined spaces; factors controlling fire severity; chemical categories of fire fuel; fire detection and notification systems; fire suppression systems; means of egress and evacuation systems; factors affecting the design of escape routes; smoke production, movement, management and ventilation techniques in the fire area; hazard and risk assessment procedures; fire resisting elements separating buildings or compartments within buildings; protection of openings; fire stopping; fire proofing and fire retardant treatments; performance-based fire protection design; prescriptive-based fire protection design. The course will also present a number of case studies on evaluating fire safety in school, medical, office, library, restaurant and gas station facilities.

8045315-2 Green and Smart Cities (2: 3,0)

Prerequisite: None

This course aims at the students to explore the “green smart city” and the intelligent ways to apply them in order to achieve the human needs, energy conservation and environmental balance. The course introduces ways and methods to apply Green and Smart solutions on the urban level according to the context characteristics. The course aims at giving students an overview of current green smart cities related projects and enable students to develop a vision on which steps can be taken to transform our cities to green smart ones.

8045316-2 Green Architecture and Sustainable Development (2: 3,0)

Prerequisite: None

The course examines the underlying principles of green building design within the built environment. The course Introduces the concept of building rating systems. It focuses on environmental issues and design processes that enable professionals to create a more sustainable world. It emphasizes the ways of achieving green buildings based on the building materials, form, internal spaces characteristics, and used systems and devices. Understanding of these issues is gained through research activity and simple various designs. Applying integration of technology to create works that are functionally, aesthetically, and environmentally sound and comprehensive. Students will develop integrated design solutions in public, commercial, or industrial contexts.